WE CLAIM:

1. A method for depositing a smooth layer of a metal onto a microrough substrate comprising

immersing, as an electrode, an electrically conductive substrate having a microrough surface in an electroplating bath containing ions of a metal to be deposited onto said surface, said plating bath being substantially devoid of levelers,

immersing a counter electrode in said plating bath

passing an electric current between said electrodes,

wherein

said electric current is a modulated reversing electric current comprising pulses that are cathodic with respect to said substrate and pulses that are anodic with respect to said substrate,

said cathodic pulses have a duty cycle less than about 50 % and said anodic pulses have a duty cycle greater than about 50 %,

the charge transfer ratio of said cathodic pulses to said anodic pulses is greater than one, and

the frequency of said pulses ranges from about 10 Hertz to about 5000 Hertz.

2. The method of Claim 1 wherein an interval of no electric current flow is interposed between said cathodic pulses and succeeding anodic pulses.

3. The method of Claim 1 wherein an interval of no electric current flow is interposed between said anodic pulses and succeeding cathodic pulses.

4. The method of Claim 1 wherein an interval of no electric current flow is interposed between said cathodic pulses and succeeding anodic pulses and between said anodic pulses and succeeding cathodic pulses.

5. The method of Claim 1 wherein said cathodic pulses and said anodic pulses succeed each other without intervening intervals of no electric current flow.

6. The method of Claim 1 wherein said cathodic pulses and said anodic pulses form a pulse train having a frequency between about 50 Hertz and about 12000 Hertz.

7. The method of Claim 1 wherein said cathodic pulses and said anodic pulses form a pulse train having a frequency between about 500 Hertz and about 10000 Hertz.

8. The method of Claim 1 wherein said cathodic pulses and said anodic pulses form a pulse train having a frequency between about 4000 Hertz and about 10000 Hertz.

9. The method of Claim 1 wherein said cathodic pulses have a duty cycle of from about 30 % to about 1 %.

10. The method of Claim 1 wherein said cathodic pulses have a duty cycle of from about 30 % to about 15 %.

11. The method of Claim 1 wherein said cathodic pulses have a duty cycle of from about 30 % to about 20 %.

12. The method of Claim 1 wherein said anodic pulses have a duty cycle of from about 60 % to about 99%.

13. The method of Claim 1 wherein said anodic pulses have a duty cycle of from about 70 % to about 85 %.

14. The method of Claim 1 wherein said cathodic pulses have a duty cycle of from about 70 % to about 80 %.

15. The method of Claim 1 wherein said metal is selected from the group consisting of copper, silver, gold, zinc, chromium, nickel, bronze, brass, and alloys thereof.

16. A semiconductor wafer having a microrough surface comprising surface areas and trenches formed therein, said microrough surface having a layer of metal deposited in said trenches and on said surface areas by the process of Claim 1.

17. The semiconductor wafer of Claim 16 wherein said metal layer on said surface areas has a thickness no greater than the depth of said trenches.

18. The semiconductor wafer of Claim 16 wherein said metal layer on said surface areas has a thickness substantially less than the depth of said trenches.

19. The semiconductor wafer of Claim 16 wherein said metal layer on said surface areas has a thickness no greater than about 50 % of the depth of said trenches.

20. The semiconductor wafer of Claim 16 wherein said metal layer on said surface areas has a thickness no greater about 20 % of the depth of said trenches.

21. The semiconductor wafer of Claim 16 wherein said metal layer on said surface areas has a thickness no greater than about 10 % of the depth of said trenches.

22. The method of Claim 1 wherein said plating bath is substantially devoid of brighteners.

23. The method of Claim 1 wherein said metal is copper and said plating bath contains a suppressor.

24. The method of Claim 23 wherein said suppressor is present in an amount of from about 100 parts per million to about 5 % by weight of said plating bath.

25. The method of Claim 23 wherein said suppressor is present in an amount of from about 200 parts per million to about 800 parts per million by weight of said plating bath.

26. The method of Claim 23 wherein said suppressor is present in an amount of about 300 parts per million of said plating bath.

27. The method of Claim 23 wherein said suppressor is an organic polyhydroxy compound.

28. The method of Claim 23 wherein said suppressor is poly(ethylene glycol).

29. The method of Claim 28 wherein said poly(ethylene glycol) has a molecular weight in the range of from about 1000 to about 12000.

30. The method of Claim 28 wherein said poly(ethylene glycol) has a molecular weight in the range of from about 2500 to about 5000.